

### REMARKS

Reconsideration and allowance of this application are respectfully requested in light of the following remarks.

#### Claim Status

Claims 1-14 and 20-24 are being considered. Claims 15-19 and 25 are withdrawn from consideration.

#### §103 Rejection

Claims 1-14 are rejected as unpatentable over Savinell (US5525436). Applicant respectfully disagrees.

In the latest Office Action, the Examiner states, at page 2, lines 11-13:

"the claimed product by process which is considered the claimed product unless Applicant provides evidence to show the unexcepted characteristics by using different steps of the process or different products..."

The instant invention produces a different product.

See the attached Declaration<sup>1</sup> of Dr. T. Schmidt that addresses Savinell and explains how the instantly claimed membranes (those made by reacting the PBI monomers in polyphosphoric acid) are different from those described in Savinell.

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<sup>1</sup> This Declaration was originally filed in US Application Serial No. 10/472814, which has issued as US7384552 (cited in this application).

Dr. Schmidt explains, after laying his foundation as an expert in the fuel cell field, that Savinell is directed to a first generation PBI membrane that was made by casting a solution of PBI in an organic solvent, removing the organic solvent, and then imbibing (doping) the membrane with an acid. Schmidt Declaration, Paragraph 8. This is collaborated by reference to Savinell at Column 7, lines 45-54, where Savinell teaches dissolving the PBI with LiCl in DMAc, driving off the DMAc with heat in a vacuum, extracting the LiCl, and then doping the film with acid ( $H_2SO_4$  or  $H_3PO_4$ ). In other word, Savinell starts with PBI polymer and then dopes it with the acid.

Dr. Schmidt also explains that the new, inventive membranes are different from Savinell's membrane. First, they are made by a different process. The monomers of the PBI polymer are mixed together in polyphosphoric acid, this solution is cast into a thin film, and then reacted to form a self-sustaining membrane. Schmidt Declaration, Paragraph 7. Likewise, in the instantly claimed invention, PBI monomers are mixed together in a *polyphosphoric acid*/sulfonating agent mixture, this is cast into a thin film, and then reacted to form a self-sustaining film. See, instant claim 1. Second, they produce a different membrane. In the Declaration, paragraphs 8 and 9, Dr. Schmidt compares the mechanical and conductive properties of the inventive membrane to

those of Savinell, and shows "clearly unexpected and superior" results for the inventive membrane to those of Savinell's membrane.

Accordingly, Applicant has demonstrated that the instantly claimed membrane is different from that of Savinell. Therefore, the instant claims patentably distinguish Savinell.

### Double Patenting Rejections

Claims 1-14 are rejected on the grounds of nonstatutory obviousness-type double patenting over US7235320, or US7332530, or US734552, or US7540984, or US7582210. Applicant continues to respectfully disagree.

MPEP 804B1 states:

"Any obviousness-type double patenting rejection should make clear:

(A) The differences between the inventions defined by the conflicting claims - a claim in the patent compared to a claim in the application; and

(B) The reasons why a person of ordinary skill in the art would conclude that the invention defined in the claim at issue >is anticipated by, or< would have been an obvious variation of >,< the invention defined in a claim in the patent." [emphasis added]

The Examiner has done neither. There is no statement of the differences and no statement of the reasons why a person of ordinary skill would conclude that the invention is either

anticipated or obvious. Accordingly, the rejection must be removed.

In the Office Action mailed January 28, 2010, the Examiner stated on page 3-4, the bridging paragraph:

"Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims are included in the broad teachings in the claims of the references. Therefore, it would have been obvious to one of ordinary skill in the art to select reactants under steps of the process in the claims of the references within the limitations of the instant claims to get the claimed proton conducting polymer membrane in the absence of a showing of unexpected results derived from said selections."

In the Final Office Action mailed July 13, 2010, the Examiner stated on page 2-3, the bridging paragraph:

"Although the conflicting claims are not identical, they are not patentably distinct from each other for the reasons as stated above and for the reasons as stated in the last office action."

Where is the statement of the "differences between the inventions defined in the conflicting claims" and where is "the reason why a person of ordinary skill would consider the differences obvious"? Answer: nowhere. By failing to make clear the differences and the reasons (as required by the MPEP), the Examiner has failed in his duty to set forth a *prima facie* case of obviousness-type double patenting against the claims of the instant application. The rejection must be removed.

Moreover, had the Examiner performed the required analysis, the impropriety of the rejection would have been clear. None of the cited patents includes any teaching of sulfonating the PBI (claim 1 recites "mixing of one or more ..., in a polyphosphoric acid/sulfonating agent mixture to form a solution and/or dispersion." [emphasis added]). This is a difference. If this *in situ* sulfonation is so obvious, why in the 5 cited patents didn't the inventors stumble upon the idea before? Answer: it wasn't obvious.

In view of the foregoing, the obviousness-type double patenting rejection must be removed.

### Conclusion

In view of the foregoing, Applicant respectfully requests an early Notice of Allowance in this application.

Respectfully submitted,



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:  
Gordon Calundann et al.

Application No.: 10/472814 = US 9,554,552

Confirmation No.: 9746

Filed: December 24, 2003

Art Unit: 1723

For: PROTON-CONDUCTING MEMBRANE AND  
THE USE THEREOF

Examiner: A. M. Fortuna

DECLARATION

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

I, Dr. Thomas J. Schmidt am a citizen of the Federal Republic of Germany and reside at Frankfurt, Germany, hereby declare and say as follows:

1. I am a fully trained chemist, having studied and graduated in chemistry at University of Ulm, Germany and prepared my ph.D. thesis at University of Ulm in Fuel Cell Research. I held positions at Ernest Orlando Lawrence Berkeley National Laboratory in Berkeley, CA and at Paul-Scherrer-Institute, Switzerland, both in applied fuel cell research and development.

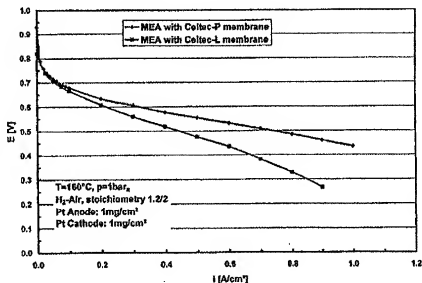
I am well acquainted with technical English.

2. I, Dr. Thomas J. Schmidt state that I have more than 5 years scientific practice in applied fuel cell membrane and membrane electrode assembly work and that I consider myself qualified by my education, knowledge and many years of experience to make this Declaration. I currently hold the position of R&D Director at BASF Fuel Cell GmbH (previously named PEMEAS GmbH).

3. In the fuel cell membrane field, I am inventor up to now of at least 5 U.S. patents and patent applications and author of more than 5 publications and lectures.
4. In view of my qualifications as outlined above, I consider myself to be an expert and to be skilled in the art of fuel cell membranes.
5. I have read and reviewed U.S. application Serial No. 10/472,814 ('814 application") including the examples.
6. I have read and reviewed US-A-5,525,436 (Savinell).
7. I conducted the following comparison between the Celtec-L and Celtec-P membranes. The Celtec-P membrane is covered by the claims of the '814 application. I have prepared Celtec P membrane as described in Claim 23 by mixing the monomers (aromatic tetraamino compounds, e.g., tetra-amino biphenyl, and an aromatic di-carboxylic acid, e.g., isophthalic acid) in polyphosphoric acid to form a solution. This solution is heated and subsequently casted to form a thin film which furthermore is treated by water vapour in order to hydrolyze in a controlled way the polyphosphoric acid to form ortho-phosphoric acid. The hydrolysis process is accompanied by precipitation of the polymer in the membrane such that a gel membrane is formed. This membrane is self-sustained.
8. The membrane according to Savinell is the first generation PBI membrane made in a laboratory setting. Celtec-L is one of the first commercial membranes and is an improvement over the Savinell membrane. Celtec-L membranes are prepared from commercially available polymer being dissolved in organic solvent, typically DMAc. Thereafter, a film is casted from such solutions which is subsequently washed to remove organic solvent. Afterwards the polymer films are imbibed with phosphoric acid in order to obtain proton conductivity of the membrane. I have compared Celtec-L versus Celtec-P membrane.

8. Results

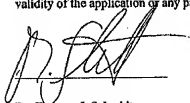
|  | Celtec L | Celtec P |
|--|----------|----------|
| E-modulus [MPa]  | 3        | 3.5      |
| Toughness [kJ/m <sup>2</sup> ]   | 19       | 169      |
| Proton conductivity [mS/cm]  | 85±3     | 120±3    |
| H <sub>3</sub> PO <sub>4</sub> :PBI ratio<br>[mol <sub>H<sub>3</sub>PO<sub>4</sub></sub> /mol <sub>PBI</sub> ] | 9        | 35       |
| Inherent Viscosity [dL/g]  | 1.12     | 5.28     |



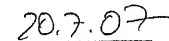
9. The mechanical properties of the membranes are different. The membrane according to Celtec P was superior in E-modulus 3.5 versus 3 for Celtec L, toughness 169 compared to 19 (almost a factor of 10 greater than Celtec L), proton conductivity 120 versus 85 and H<sub>3</sub>PO<sub>4</sub>:PBI ratio 35 versus 9 (almost a factor of 4 greater than Celtec L) and inherent viscosity 5.28 versus 1.12 (almost a factor of 5 greater than Celtec L). These results are clearly unexpected and superior.



I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Dr. Thomas J. Schmidt



Date